INVESTMENT PERFORMANCE OF HUD SUBSIDIZED MULTI-FAMILY HOUSING

by

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ABSTRACT

The investment performance of U.S. Department of Housing and Urban Development (HUD) subsidized multi-family housing projects was examined. Financial data and property characteristics for sixty-one properties was obtained from the portfolio of a major syndicator of limited-dividend, tax shelter limited partnerships. The properties in the sample were selected because they had a minimum fifteen year operating history (1977 to 1991) and they provided geographic diversity.

The sample was compared to other investment vehicles and economic indicators to determine its relative performance. Diversification issues were explored within the sample. The results indicated that the sample as a whole was a modest inflation hedge although the growth in rents of the sample actually outperformed the CPI_UX rent index over the study period. The net operating income stream experienced as much growth as the stock market with less volatility, implying less risk. The findings were similar when the income stream was compared to U.S. Treasury Bill yields and the Consumer Price Index. Movements in the income stream also displayed negative or low positive correlations with these indicators, suggesting diversification benefits to a portfolio of mixed assets.

The sample, when grouped by economic regions, displayed some negatively correlated income streams. The same results was not obtained when the sample was grouped by subsidy levels and unit sizes. Again, these results suggest that there are diversification benefits to a regionally diversified portfolio.

The main contributor to movements in income was found to be operating expenses and projects with high initial income streams fared worse than projects with low initial income streams. The relative positioning of the property in the

market is important. Realistic, stabilized operating expenses is also key to not having the income stream erode over time.

Thesis Supervisor: William C. Wheaton
Title: Professor of Economics

1/INTRODUCTION

There has been an upsurge in investor interest recently, in multi-family housing and its place in the diversified real estate portfolio. This interest stems from the realization that apartment returns have been less volatile than other commercial real estate returns and have even outperformed them in recent years.[1] As well, many institutional investors such as pension funds have been coming under increasing pressure, by housing activists, developers and others, to develop a housing investment strategy to fill the void left by the disappearance of the S&L's, banks and life companies after the real estate crash of the late eighties and early nineties.[2]

There has been very little research into the investment performance of multi-family properties because the vast majority of units are developed, owned and managed by small firms and the product itself is small in value, compared to other forms of commercial real estate. Therefore, it has largely been overlooked by the investment and academic communities. It is only now that knowledge is

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[1]Gyourko, Joseph and Linneman, Peter. Comparing Apartment and Office Investments. *Real Estate Review* (Summer, 1993):17-23.

[2]Louargand, Marc A. Pension Fund Investment in Housing. Center for Real Estate, Massachusetts Institute of Technology. Working Paper WP#34. September, 1991.

being gained about the characteristics of this property type and its place in the real estate market.

One segment of the rental apartment market that has received even less attention, from an investment performance viewpoint, is the low and moderate income sector. This sector represents a significant portion of the rental market and a large percentage of this market is government subsidized.

In 1984, the U.S. Department of Housing and Urban Development (HUD) had approximately 1.7 million units in 14.5 thousand properties receiving assistance through its various subsidy programs. This represented 13% of the rental housing supply in the United States.[3]

While demand in other real estate sectors has weakened in recent years, it is still strong for low and moderate income rental housing . This is due to many factors including a diminishing stock in the low and moderate income sectors and more households falling below the poverty line due to the weakness in the economy.

In 1974, 9 million households were poor (below the official poverty line). This figure increased to 11.5 million, 12.3% of the nations households, by 1989. Of this group, the biggest increase was in renter households with the head of the household less than 65 years of age. This category experienced a 62% increase from 1974 to 6.2 million households. By 1989, 4.3 million households lived in public housing or subsidized housing, almost twice the number in 1974. In contrast, the number of low rent, unsubsidized, units (units renting for less than $250, in constant 1989 dollars) fell from 8.6 million in 1974, to 6.0 million by

[3]Hodes, Bradley, et al. *HUD/FHA - Insured Rental Housing*. U.S. Department of Housing and Urban Development, April, 1987.

1989.[4] This indicates that the demand for low cost rental housing is increasing and the stock of units is decreasing.

The Tax Reform Act, 1986 severely restricted the tax advantages of low income housing, and replaced it with the Low Income Housing Tax Credit program. The response to the new program has been modest, partly because of overbuilding in the market place, and partly because of the credit crunch of the late eighties and nineties. The construction of multi-family units is the lowest it has been for decades. At current levels of construction, vacancy rates will fall, especially in the higher-end units, applying further pressure on the low-end units.[5]

There are many perceptions about multi-family housing, as an investment product, that exists today. Some of the common concerns about apartments relate to management problems and government intervention. Multi-family properties are viewed as being management intensive, liability ridden and politically sensitive.

Many investors feel that management is much more intensive and difficult because the tenants are individual household, not businesses, and it is their home and sense of security that is in question. The high turnover in the rent roll is of concern as well because of the wear and tear of moves and because of the tenant concessions required to attract new tenants. Another concern is the easy targeting of apartments by government for regulatory control to ease the housing burden. Although, rent controls have shown to be more harmful than good in the long term, it is very politically popular in the short term. Institutional investors, especially, fear the political liability of being a residential landlord and being

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[4]Apgar, Jr., DiPasquale, et al. *The State of the Nation's Housing: 1991*. Joint Center for Housing Studies, Harvard University, 1991.
[5]Ibid.

exposed to fraudulent or punitive litigation because they are viewed as having deep financial resources. These concerns are even greater with low and moderate income housing.[6]

This study attempts to analyse the investment performance of low and moderate income multi-family properties to answer some of the investors questions and concerns regarding this type of investment. This will be accomplished by selecting a sample of properties from a portfolio of low and moderate income multi-family properties belonging to a major syndicator of low income housing, limited partnerships. Their portfolio primarily consists of HUD subsidized multi-family projects started in the late sixties to the present. The selection of properties, for this sample, was based upon geographic diversification and operating history. A minimum fifteen year history, from 1977 to 1991, was required to be included in the sample. Financial and property data was collected for each property.

The first part of the analysis deals with the overall behaviour of the sample. The income stream (net operating income) is compared to economic indicators *Consumer Price Index, Dow Jones Earnings per Share Index*[7], and the one year, average, Treasury Bill rate to discern how the apartment earnings performed against other widely used financial and economic benchmarks. The perspective is from income and risk and not return.

The income series was also examined for any diversification effects on a portfolio of mixed assets. Diversity within the sample by economic region, level of HUD subsidy and unit size was studied as well. Chapter three presents the analysis and results.

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[6]Louargand, Ibid. See also DiPasquale, Denise and Cummings, Jean L. *Accessing Capital Markets for Affordable Rental Housing*. Joint Center for Housing Studies, Harvard University. December, 1990.

[7]The index is derived from other indicators. See chapter 3 for an explanation.

The next section looks at the underlying causes of movements in the net operating income. It attempts to assess which of the three components of income - gross potential rents, vacancies and operating expenses - influenced it the most by employing time series, linear regressions. Chapter four presents the analysis and results.

The last section of the analysis attempts to determine which property specific characteristics influenced the growth and variance in the income stream the most by employing cross-section, linear regressions. This looks at characteristics of the properties going into the investment and correlating these characteristics to the growth in net operating income over the fifteen year study period. Chapter five presents the analysis and results.

2/THE DATA

2.1 Portfolio Description

The sample of properties selected for this study was obtained from a large portfolio held by a major syndicator of limited-dividend, low-income housing partnerships. The properties selected represented geographic diversity and each had a minimum fifteen year operating history (1977 to 1991). Section 2.2 provides a detailed description of the investment structure and operation of these properties.

The sample of properties consists of sixty-one multi-family developments situated in twenty-one metropolitan areas throughout fifteen states of the continental United States. Table 2.1 specifies the geographic representation of the sample of properties. The properties represent a mixture of urban and suburban locations and high-rise and garden-style construction. Properties located in rural areas were deliberately excluded as the operating and market conditions differed substantially from those of the metropolitan properties. The smallest property in the sample has 55 apartment units and the largest property has 508 units. The mean property size is 190 units.

The sample of properties had a mix of unit sizes ranging from studio/efficiency apartments to six bedroom apartments. Most apartments contained from one-bedroom

Table 2.1
Distribution of Sample by Metro Area and Region

Metro Area	Region	Number of Properties
San Francisco, CA	Northern California	7
Los Angeles, CA	Southern California	4
Denver, CO	Mineral Extraction	2
Colorado Springs, CO		1
Chicago, IL	Industrial Midwest	1
South Bend, IN		1
Indianapolis, IN		6
Detroit, MI		4
Buffalo, NY		2
Cleveland, OH		1
Cincinnati, OH		1
Pittsburgh, PA		3
Miami, FL	Old South	3
Atlanta, GA		1
Louisville, KY		2
Chattanooga, TN		2
Nashville, TN		1
Washington, D.C.	Mid-Atlantic Corridor	1
Baltimore, MD		2
New York, NY		8
Boston, MA	New England	8
Total		61

to three bedrooms. Other than standard unit features, the level of amenities varied from property to property. Data on amenities was not considered for this study.

All of the properties were either developed or acquired and substantially rehabilitated during the late 1960's to the mid 1970's. Most of the properties

were financed pursuant to the U.S. Department of Housing and Urban Development's (HUD) Below Market Interest Rate Programs (BMIR). A few properties in the sample were only insured pursuant to the HUD Mortgage Loan Insurance Program and did not have any HUD subsidies. A small number of the properties considered were market rate rental apartments. In addition to the BMIR subsidies, many of the properties had additional rent supplements paid directly to the landlord in the form of Section 8 subsidies. A more detailed outline of the HUD programs is presented in Section 2.3. Table 2.2 provides a complete listing of the programs and the number of properties participating in each program.

2.2 Investment Structure and Property Operations

The investments typically were structured as a limited partnership consisting of a general partner developer and a syndication of investors as the limited partner. The general partner developer often contributed the land as equity and the limited partner contributed cash representing the balance of the equity. Financing typically was obtained from HUD through various programs or from private financial institutions with HUD insuring the mortgage to provide credit enhancement. The level of financing was generally around the 0.75 loan/value ratio.

The limited partnership syndications were interested primarily in the potential tax losses and thus were attributed a disproportionate share of any tax losses realized, whereas, the general partner developer received a disproportionate share of the cash flow realized from the properties. In most cases, the general partner developer was also the managing agent for the property and accordingly was paid management fees by the limited partnership.

The HUD BMIR programs and the Mortgage Loan Insurance programs, in exchange for the subsidies, regulated the operation of the properties to ensure a supply of low and moderate income units. The rent of the units was set by HUD in accordance with government established formula relating the rents primarily to operating conditions and the return of a small profit. In addition, the developer had maintenance standards, general replacement reserve requirements and stipulated dividend distribution restrictions regulating the operation of the property.

The original conditions of the BMIR programs allowed the investors, after twenty years of operation to prepay the mortgage and then convert the properties to fair market value units. In 1987, the U.S. Congress enacted the Emergency Low Income Housing Preservation Act (ELIHPA) which substantially revised the pre-payment criteria and essentially placed a moratorium on pre-payment of any outstanding mortgages.

Table 2.2
Distribution of Sample by HUD Subsidy Type

HUD Subsidy Type	Number of Properties
Section 236, BMIR	49
Section 221(d)(3), BMIR	3
Section 221(d)(4)	4
Section 220	2
Section 8	45
No subsidy	2

In 1990, this legislation was re-affirmed by the Low Income Housing Preservation and Resident Homeownership Act (LIHPRHA) which placed expiring use restrictions on the BMIR subsidized properties and encouraged

investors to maintain the properties as low and moderate income housing units for the remainder of the mortgage term, typically another twenty years. In return, LIHPRHA relaxed some regulations governing the operation of the properties to allow the investors to receive a portion of the benefits of fair market value properties.

2.3 HUD Programs

2.3.1 Section 221(d)(3) Mortgage Insurance and Subsidy Program

Section 221(d)(3) of the National Housing Act was enacted in 1961 and is no longer available for new commitments. There were two parts to the program: mortgage insurance and BMIR.

The mortgage insurance portion of the program allowed eligible projects to be insured to a maximum of 100% of project costs by HUD. This mortgage insurance was available only for non-profit and cooperative investors. Financing was obtained from HUD approved private lenders at prevailing market rates. None of the properties in this portfolio fell into this category.

The second portion of the program was the BMIR subsidies in the form of mortgages provided to the developer by the Government National Mortgage Association (GNMA) at an interest rate of three percent. To be eligible for such a subsidy the properties were required to be newly constructed or substantially rehabilitated. The subsidies were available to non-profit, cooperative, private limited-dividend, or public sponsors. The mortgages were forty year term fully amortizing loans that were originally eligible for pre-payment at the end of twenty years. As indicated herein, this provision was essentially removed by ELIHPA and LIHPHRA.

The HUD approved rents were based upon the operating costs, the debt service at the subsidized mortgage rate, and the return of a small profit where applicable. Rent increases were permitted but again, HUD approval was necessary. Frequently, such approvals, if extended, was extended well after the incursion of the higher costs. Tenants were entitled to review all applications for increases and appeal any decisions. The rent increases were based solely on increases in operating costs and taxes and had to be well documented by the landlord. The whole application process, in addition to being administratively expensive, could take several months before any rent increases take effect.

The units, in addition to rent regulation, had tenant eligibility restrictions. Only families whose income was lower than the HUD defined limit of 95% of the median income for the area were eligible to occupy these units. Some households were also eligible for rent supplements if their incomes were not sufficient to meet the HUD approved basic rent. These supplements were paid directly to the landlord.

As well, HUD regulated the operation of the properties including the limiting of dividend payments to the investors and requiring that the property operate as low and moderate income rental accommodation for twenty years.

2.3.2 Section 236 Mortgage Insurance and Subsidy Program

The successor to the Section 221(d)(3) program was the Section 236 of Title II of the National Housing Act BMIR program enacted in 1968. Again this program is no longer available for new commitments. This program, in contrast to the Section 221(d)(3) program, required the mortgage to be provided by a HUD approved bank or financial institution at the prevailing commercial lending rates. HUD again insured the mortgage and again provided interest subsidies, but the subsidies took the form of payments made directly to the lender, thus

reducing the effective mortgage rate to the investors to one percent. These payments remained constant throughout the duration of the mortgage.

The provisions regarding dividend payments, rent levels, tenant eligibility and operating and maintenance standards continued with some revisions. Tenants, as with the Section 221(d)(3) program, were entitled to review and appeal all rent increase applications and decisions. As well, ELIHPA and LIHPHRA applied to Section 236 subsidized properties.

In accordance with Section 236, tenants were required to pay the greater of rent equivalent to 30% of their incomes or the HUD approved rent. This provision had not existed pursuant to the Section 221(d)(3) program.

2.3.3 Section 221(d)(4) Mortgage Insurance Program

Section 221(d)(4) of the National Housing Act was enacted in 1959. The program is not available for new commitments. The program, like the section 221(d)(3) program and the section 236 program, provided mortgage insurance. However, the section 221(d)(4) program did not provide interest subsidies. The program provided mortgage insurance for loans from HUD approved private lenders to a maximum of 90% of project costs. As was the case for the section 221(d)(3) and section 236 programs, HUD regulated the rental rates in the development. In contrast to the section 221(d)(3) program, tenant eligibility was not regulated. Further, pre-payment of the mortgage was not restricted unless another layer of subsidy existed. Therefore, the property may revert to fair market value units at any time.

The rent levels in these properties tended to be more consistent with those of the regular rental market. The operation and return on investment of the properties was not heavily regulated as it was for section 221(d)(3) and section 236 programs. The owners had greater latitude in the operation of their

properties. However, tenants had lesser latitude as compared to section 221(d)(3) and section 236 programs as they were not entitled participate in the rental increase application process.

2.3.4 Section 220 Mortgage Insurance Program

Section 220 of the National Housing Act, enacted in 1954, was essentially the same as the Section 221(d)(4) program; Section 220 is specifically targeted for prescribed urban areas in need of revitalization as defined by HUD. The program is no longer available for new commitments.

2.3.5 Section 8 Rental Assistance Program

The Section 8 Rental Assistance Programs was enacted in 1974 and is available for new commitments. There are four parts to the program: existing housing, new construction, substantial rehabilitation, and moderate rehabilitation. Each program had its own specific target market and regulatory guidelines, which are too extensive for comprehensive analysis within this work. The common element of all four sub-programs is that the subsidy is in the form of rental payments made directly to the investor to supplement the rent being paid by the tenant for a particular unit. Allowable rental rates differed from all other programs considered herein in that HUD annually determines and sets the fair market value of rent of each unit.. As with the other programs, the properties must be maintained to HUD standards.

Tenant eligibility was restricted, as with the section 221(d)(3) program to families having adjusted incomes not exceeding eighty percent of the median income of families of four in the area. Typically tenants are required to pay rent equivalent to twenty-five to thirty percent of adjusted income. The assistance

payments are set forth in a contract between the landlord and HUD and vary in duration.

It is possible for all other programs outlined in this chapter to operate in conjunction with the Section 8 program.

2.4 Property Level Data

For each of the sixty-one properties the gross potential income, financial vacancy, operating expenses and net operating income for the years 1977 to 1991 was obtained.[1] The Section 236 and Section 221(d)(3) interest subsidy payments were excluded from the gross potential rent figures as the actual ability of the property to generate rents was being examined. Had these subsidies been included, any trends due to rents potentially could be masked . The subsidy level was captured in a separate variable, titled *SUBSIDY.*[2] Similarly, the Section 8 rent subsidies were not captured as the rental assistance payments supplemented tenant incomes rather than supplemented property incomes. The number of units, the total number of bedrooms and the metro area was also

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[1]For this research, the following definitions applied:

> **Gross potential income** - is the total allowable rent that is able to be charged.
> **Financial vacancy** - is the difference between gross potential income and net rental income.
> **Operating expenses** - were all expenses required to maintain the operation of the property excluding depreciation, interest, principle, mortgage insurance and replacement reserves.
> **Net operating income** - is the gross potential income net of vacancies and operating expenses.

[2]A measure of the level of subsidy was required to determine whether there were any significant differences in the behaviour of the properties based upon the extent of government assistance. This variable was calculated by dividing the annual subsidy by the average annual gross potential income for each property. For Section 236 properties, the annual subsidy was the interest reduction payments made by HUD and for Section 221(d)(3) properties, the effective annual subsidy was assumed to be the difference between the prevailing market mortgage rate at the time of closure on the permanent loan and the 3% mortgage given by GNMA.

captured for each property. This was to analyze the correlations between the financial data and property characteristics.

For the analysis the arithmetic means of annual gross potential income, financial vacancy, operating expenses and net operating income for each property was used. To avoid misleading results as six properties did not operate prior to 1978 and two properties did not operate until 1979. Had the aggregate values been used, the results would have been understated for 1977, 1978 and overstated for the year to year changes in those variables for the first two years.

2.5 Data Limitations

One of the limitations when using a cash flow series is the inability to compare the investment performance of the subject data against a return series of stocks, bonds, treasuries or other real estate products such as the Russell/NCREIF Index. As yearly cash flow is only one component of return on investment,[3] valuations of the subject properties would be required as well to obtain the complete return series. This was not readily available to the writer at the time of this work. However, had the valuations been available, the problems with appraisal based returns would still have been present and further complicated by the fact that the properties are heavily government regulated which raises various valuation issues[4]

The diversity of the sample is another limitation in the data series. Over 50% of the properties are managed by three firms, which raises the issue of the

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[3]Pagliari, Joseph L. and Webb, James R. Past and Future Sources of Commercial Real Estate Returns. *The Journal of Real Estate Research* (7)4:387-421, 1992.

[4]Many articles have been written on the problems associated with appraisal based returns. Two widely cited are Wheaton, W.C. and Torto, R.G. Income and Appraised Values: A Reexamination of the FRC Returns Data. *AREUEA Journal* (17)4:439-49, 1989 and Geltner, D. Bias in Appraisal-Based Returns. *AREUEA Journal* (17)3:338-52, 1989.

extent to which these particular managers' practices influenced the results. The sample also would benefit from further diversification in geographic location. Only seven of the eight geographic regions are represented herein and within the regions, some metropolitan areas are more heavily represented than others. The results may favour one region.

Finally, the sample size itself is somewhat limiting. A sample of over one hundred properties may produce more statistically significant relationships within the data set itself.

3/SAMPLE BEHAVIOUR

In order to assess the performance of government subsidized multi-family properties, the behaviour of the sample must first be understood. It is only then that further analysis can be undertaken to determine the causes of this behaviour and its implications.

In Section 3.1, the sample was compared against economic indicators to determine the relative performances of the sample over a fifteen year period, 1977 to 1991. These comparisons provided insights into the ability of the sample's income stream to hedge against inflation and produce growth. The relative variance of these data series was also measured to provide insights into the risk of the income streams.[1]

In Section 3.2, the sample was compared to the entire U.S. rental market to assess the ability of the sample to generate growth in rents compared to the general rental housing market. From this, it can be determined whether the rents in HUD subsidized units kept pace with the rest of the market

[1]It should be noted that risk, for the purposes of this research, was measured in terms of relative volatilities of the income or expense streams and not in terms of asset price or total return.

Section 3.3 tested the sample for correlations in net operating incomes across regions, HUD subsidy levels and unit sizes, to determine if there were diversification benefits to the sample.

3.1 Sample Performance Against Economic Indicators

The mean net operating income was calculated for each property by year, in nominal dollars, using the following identity:

$$NOI = GPI - VAC - OP\_EXP$$

where,

NOI = net operating income

GPI = gross potential income

VAC = financial vacancy

OP_EXP = operating expenses

Using the tabulated results, the *NOI*s for the sample was compared to a) the *Consumer Price Index* (*CPI*), the *Dow Jones Earnings per Share* series[2] and the one year average *Treasury Bill* rates.

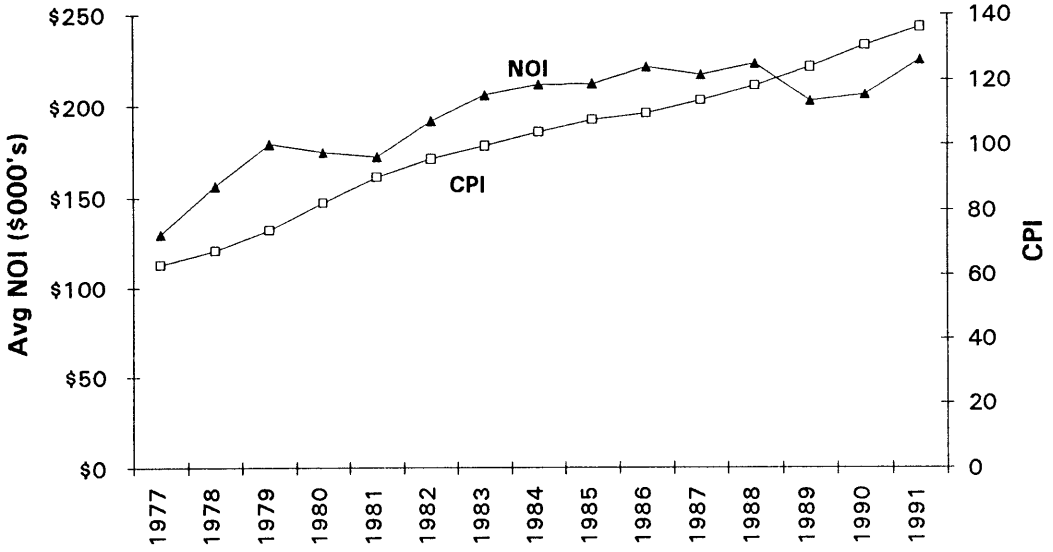
3.1.1 NOI as an Inflation Hedge

The sample *NOI*s and the *CPI* was compared from 1977 to 1991 to determine if the *NOI* growth matched the *CPI*. As indicated by Figure 3.1, the *NOI* stream tracked the *CPI*, in the long run, with a correlation coefficient of 0.871 (Table 3.1). The total nominal growth in *NOI* over that time period was

[2]The *Dow Jones Earnings Per Share* was derived from the *Dow Jones Price Index* and the *Dow Jones Price/Earnings Ratio* for the respective years.

74%. By comparison, the *CPI* growth was 116%. Although not a perfect inflation hedge, this is consistent with findings by other researchers.[3]

Figure 3.1
Growth in Nominal Earnings and CPI



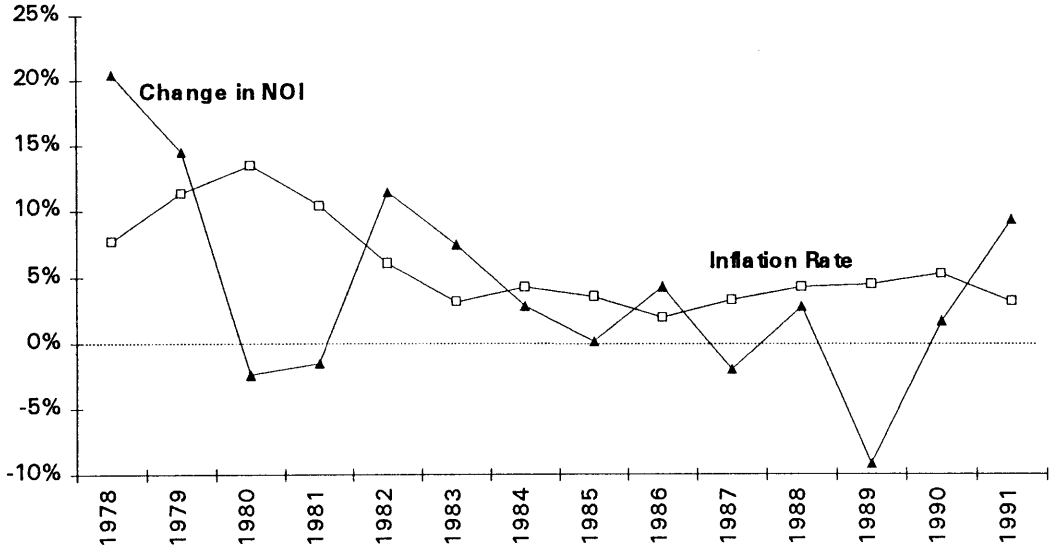
Sources: U.S. Bureau of Labor Statistics and author.

Additionally, the first differences of *NOI* (ΔNOI) and *CPI* (inflation rate) were compared to gauge the variance in their respective movements. The changes in *NOI* appear to lag the changes in *CPI* or inflation rate by two years (Figure 3.2). In the late 1970s to the mid 1980s, the lag appears quite evident. If the rental adjustment process is considered for these units the findings are

[3]There has been a tremendous amount of research into the capacity of real estate to hedge against inflation. Most researchers agree that real estate does provide some degree of protection, although not as much as previously thought. As well, different product types appear to have different hedging capabilities. For more information, see Wurtzebach, C.H., Mueller, G.R. and Machi, D. The Impact of Inflation and Vacancy of Real Estate Returns. *The Journal of Real Estate Research* (6)2:153-68, 1991; Rubens, J.H., Bond, M.T. and Webb, J.R. The Inflation-Hedging Effectiveness of Real Estate. *The Journal of Real Estate Research* (4)2:45-55, 1989; Hartzell, D., Hekman, J.S. and Miles, M.E. Real Estate Returns and Inflation. *AREUEA Journal* (15)1:617-37, 1987; Sagalyn, L.B. and Louargand, M.A. Real Estate and the Next Recession. Center for Real Estate Development, Massachusetts Institute of Technology. Working Paper FP#1, September 1989; Pagliari, J.L. and Webb, J.R., Ibid.

consistent. Since rent increases are based upon historical operating costs and the approval process is not immediate, a lag between movements in inflation and movements in the *NOI* would be expected.

Figure 3.2
Changes in NOI and the Rate of Inflation



Sources: U.S. Bureau of Labor Statistics and author.

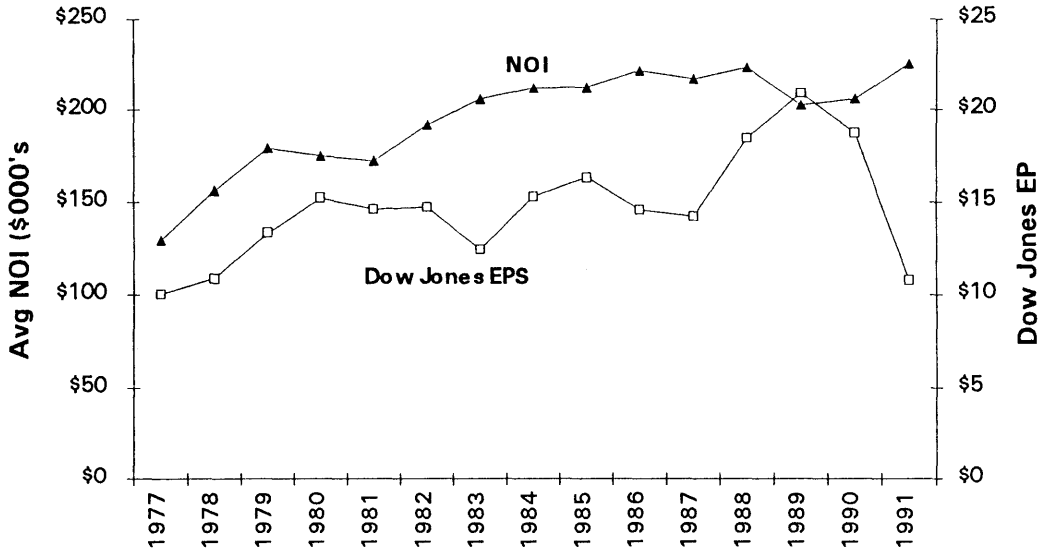
Figure 3.2 also indicates that the swings in *NOI* have been more volatile than the *CPI*, suggesting that the *NOI*, although adjusting for inflation over the long term, has been more inconsistent and reactive in its short term adjustments, as evidenced by the low correlation between ΔNOI and the inflation rate (Table 3.2).

3.1.2 NOI as a Yield on Investment

The same methodology was used to compare *NOI* and the *Dow Jones Earnings Per Share* series to determine if the growth in *NOI* matched the growth in earnings of a portfolio of common stocks. The results indicate the relative

performance of the sample as an investment good. The *Dow Jones* series was selected as a proxy for the market portfolio of common equities so that the systematic risks and the current yields associated with those

Figure 3.3
Growth in Nominal Earnings



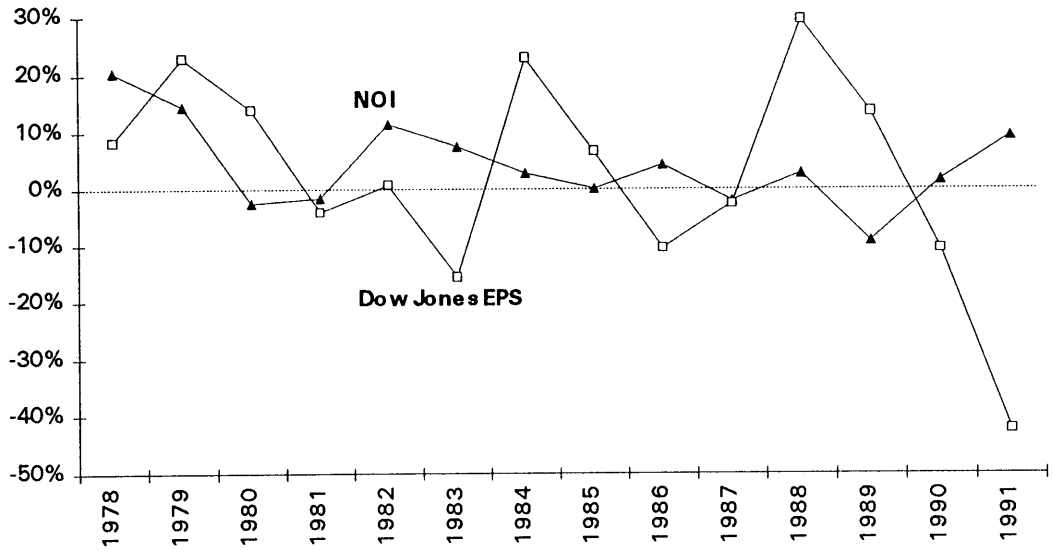
Sources: Dow Jones Company and author.

risks may be compared.

Figure 3.3 compares the two income streams throughout the study period. The apartment income stream appears to have fared better than the *Dow Jones* and experienced less volatility, implying less risk (Figure 3.4). The *Dow Jones Earnings per Share* growth was 7.5% compared to 74% in the *NOI*. The correlations indicate that movements in *NOI* are actually negatively correlated to movements in the *Dow Jones* (Table 3.2). This interesting result has implications for diversifying a portfolio of mixed assets and is consistent with two commonly held perceptions of the investment community : real estate is less volatile than stocks and bonds and real estate is negatively correlated to stocks

and bonds. Some researchers have found data to support these commonly held perceptions.[4]

Figure 3.4
First Differences: NOI and Dow Jones Earnings per Share



Sources: Dow Jones Company and author.

Given the performance of the sample against a portfolio of common equities, further investigation of the sample's performance against widely accepted benchmarks was warranted. For this measure the yield of one year *Treasury Bills* over the fifteen year period was used. *Treasury Bill* yields were used as it is widely accepted by the investment and academic communities as a risk-free investment.[5] By comparing the income stream from a risky investment

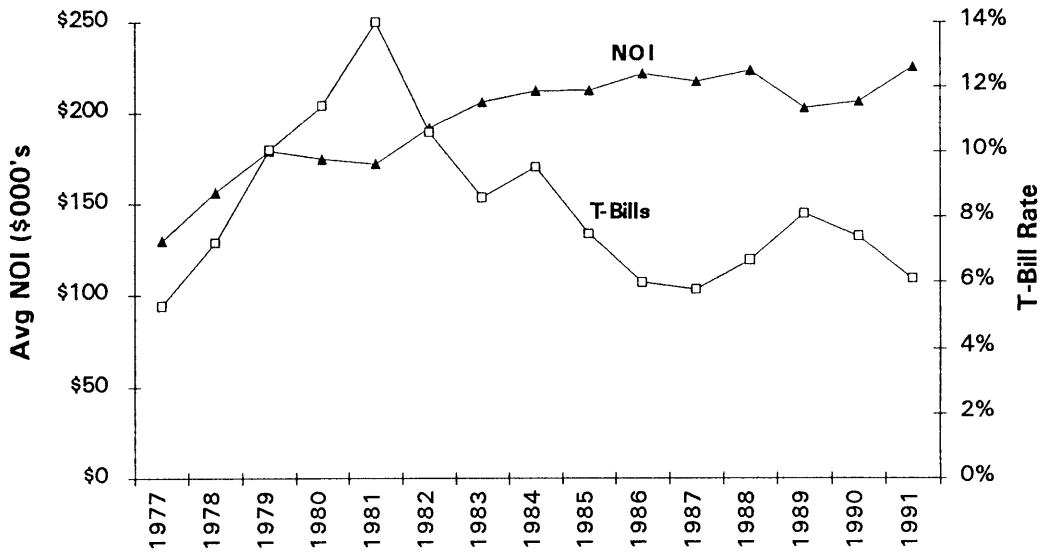
[4]Hartzell and Webb found that many institutional investors thought real estate would provide slightly negative correlation of returns with stocks and zero correlation with bonds. Miles, Cole and Guilkey found that commercial real estate provided some diversification benefits for stock, bond and T-Bill portfolios. It should be noted that apartment earnings were not part of the research in both cases.

[5]*Treasury Bills* are considered a risk-free asset, but the yearly yields are not risk free and are subject to systematic risks.

against the income stream from a risk-free investment, the relative risk and performance of the properties' earnings can be discerned.

Figure 3.5 indicates the *Treasury Bill* yields outperformed the properties' earnings prior to the early 1980s, a period of high inflation and high interest rates. Interest rates have fallen steadily since that

Figure 3.5
Growth in Nominal Earnings and T-Bill Yields



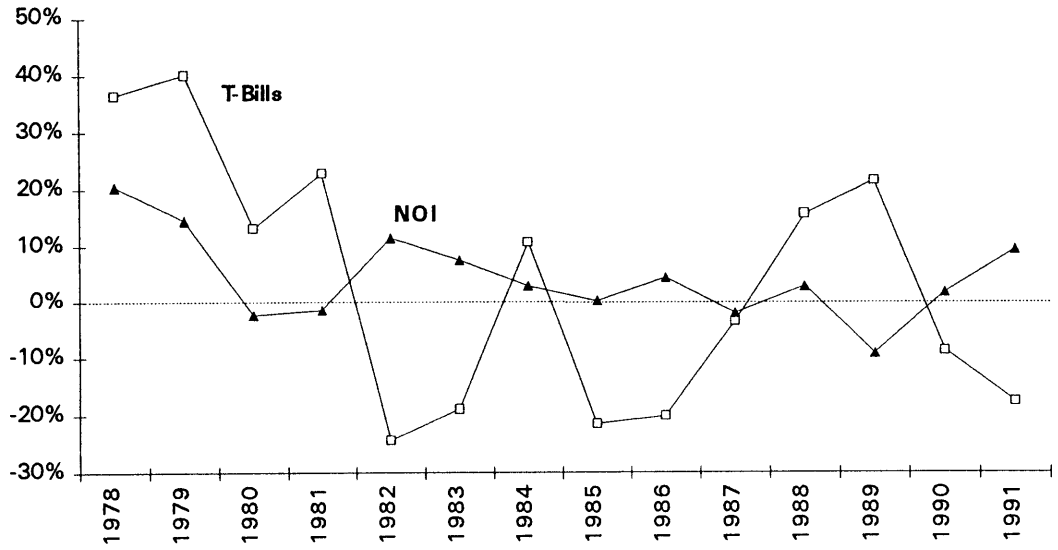
Sources: Economic Report of the President and author.

time, with the exception of a non sequitur in the late 1980s, but the *NOI* stream has remained relatively stable, with small growth. The yields cannot be compared on absolute terms, but the data indicates that the *NOI* has been more consistent over the long term as illustrated by Figure 3.5 and Figure 3.6.

Figure 3.6 illustrates the comparative movements in *NOI* with those of *Treasury Bill* rates, indicating the movements in the *Treasury* rates have been more volatile than those in *NOI*. An examination of the correlation indicates a slight positive correlation (Table 3.2) suggesting that the movements were

independent. This not only implies that the *NOI* stream was less risky but also that the properties' earnings are a good choice for diversification of a portfolio of mixed assets, reinforcing the findings of the previous section.

Figure 3.6
First Differences: NOI and One-Year Treasury-Bills



Sources: Economic Report of the President and author.

3.2 Growth in Nominal Rents

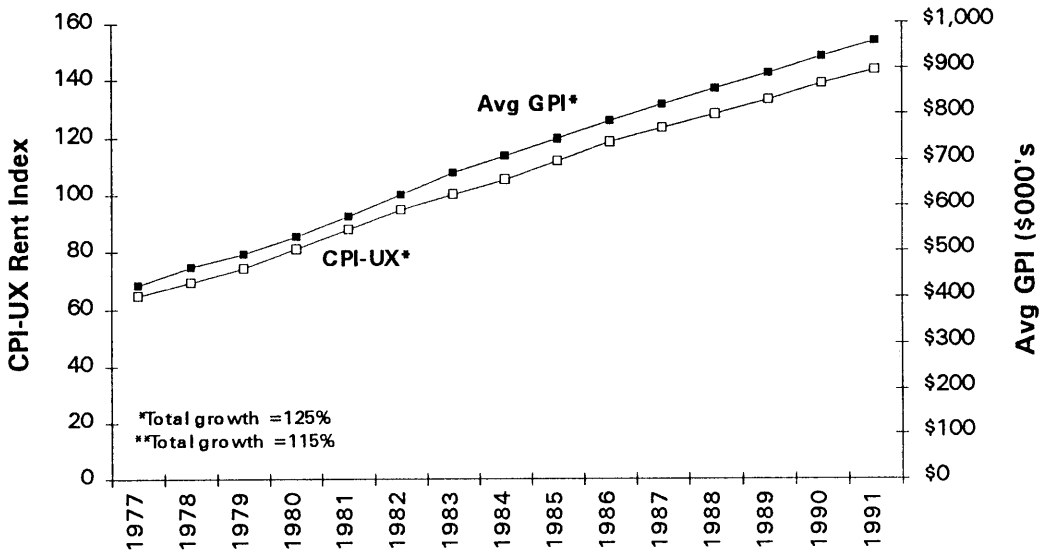
One of the concerns amongst investors in low income subsidized housing is the ability of the rental income stream to keep pace with the general rental market.[6] The rents are capped or heavily regulated by HUD, as indicated herein and therefore are perceived to be inelastic. To test this assumption, the growth in *GPI* or rents was compared to the growth in the *CPI_UX Rent Index*. The *CPI_UX Rent Index* serves as a proxy for all multi-family rental accommodation in the United States. Through this comparison, some conclusions can be reached

[6]DiPasquale, D. and Cummings, J.L. Accessing Capital Markets for Affordable Rental Housing. Joint Center for Housing Studies, Harvard University. December, 1990.

about the performance of this sample in contrast to the general rental housing market.

The nominal average *GPI* when compared to the *CPI-UX Rent Index* (Figure 3.7) has not only tracked the national rent index but has actually exceeded the performance of the national rent index. The nominal *GPI* of the data series increased by 125% throughout the fifteen year period whereas the national rent index only increased by 115% for the same period, which indicates that HUD has allowed the rents of these units to maintain the same

Figure 3.7
Growth in Nominal Rents



Sources: U.S. Bureau of Labor Statistics and author.

growth as market rate units. This is not to say that they are receiving as much rent as the market rate units, but that the growth in rents is the same.

Figure 3.7 shows the movements of the rental income streams throughout the study period. The *CPI-UX* series has been more volatile but the two movements appear highly correlated which is supported by a coefficient of determination of 70% and a ß-parameter of 0.890 (significant at the 1% level).

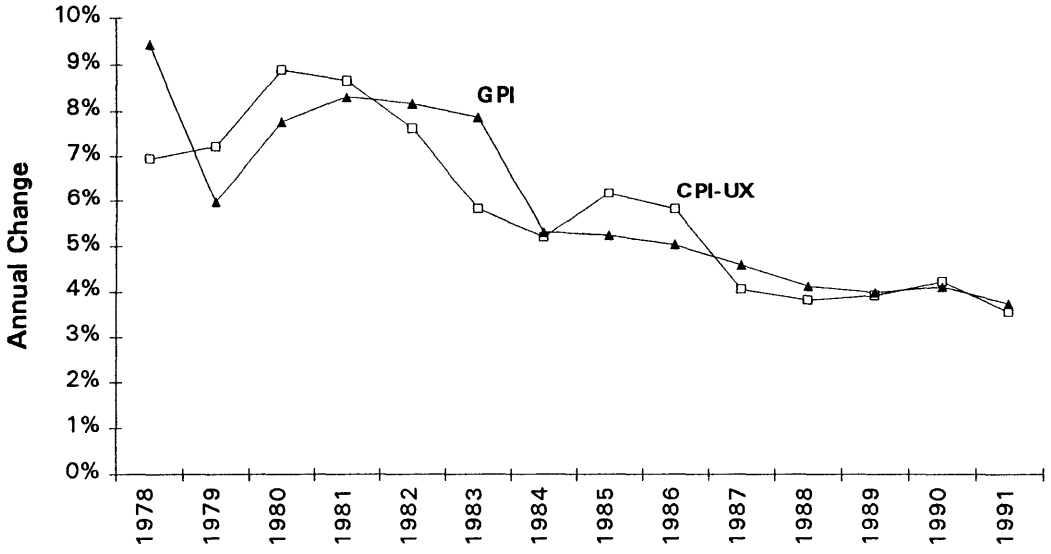
Table 3.1
Correlation of *NOI* to Economic Indicators

	NOI	DJ EPS	CPI	T-Bills
NOI	1			
DJ EPS	0.458	1		
CPI	0.871	0.552	1	
T-Bills	-0.234	0.144	-0.287	1

Table 3.2
Correlation of Δ*NOI* to Economic Indicators

	Δ*NOI*	ΔDJ EPS	Inflation Rate	ΔT-Bill
Δ*NOI*	1			
ΔDJ EPS	-0.1064	1		
Inflation Rate	0.1057	0.3712	1	
ΔT-Bill	0.1158	0.6187	0.6359	1

Figure 3.8
Annual Change in Nominal Rents



Sources: U.S. Bureau of Labor Statistics and author.

These results indicate that the HUD subsidized rental income stream has not only kept pace with the rest of the rental housing market but has done so with less risk, contrary to the perceptions of the investment community.

3.3 Diversification Within the Sample

With the advent of Modern Portfolio Theory many studies have shown that diversification benefits the performance of real estate portfolios by reducing the risk of the overall portfolio. Diversification may be by product type, geography and local economies amongst others. This data set was tested for diversity by economic region,[7] subsidy level and unit size. Table 2.1 illustrates the breakdown of the sample by region and Table 3.3 illustrates the breakdown by subsidy level and unit size (average number of bedrooms). Correlations of *NOI*s within each category were examined to determine the extent of any diversification benefits to the sample.

In the regional matrix (Table 3.4), the Industrial Midwest, Mid-Atlantic Corridor and New England exhibited strong positive correlations indicating an absence any diversification benefits between these regions. The only region that would add diversity to the sample is the Old South, which was negatively correlated with Southern California, Mineral Extraction, and the Mid-Atlantic Corridor and exhibited positive, but very low, correlations with the other three regions.

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[7]The eight region economic diversification map, developed by Hartzell, Shulman and Wurtzebach, was used for this study. This method was shown, by Malizia and Simons, to be superior than naive geographic diversification used previously. For more information, see Hartzell, D.J., Shulman, D.G. and Wurtzebach, C.H. Refining the Analysis of Regional Diversification for Income-Producing Real Estate. *The Journal of Real Estate Research* (2)2:85-95, 1987; Malizia, E.E. and Simons, R.A. Comparing Regional Classifications for Real Estate Portfolio Diversification. *The Journal of Real Estate Research* (6)1:53-67, 1991; Mueller, G.R. and Ziering, B.A. Real Estate Portfolio Diversification Using Economic Diversification. *The Journal of Real Estate Research* (7)4:375-86, 1992.

Table 3.3
Distribution of Sample by Subsidy Level and Unit Size

	Number of Properties
By Subsidy Level	
Less than 20%	12
Between 20% - 30%	29
Greater than 30%	20
By Average Bedroom Size	
Less than 1.5	19
Between 1.5 - 2.0	25
Greater than 2.0	17

Northern California exhibited positive, but low, correlations with all regions. Southern California exhibited a semi-strong positive correlation with

Table 3.4
***NOI* Correlations by Region**

	N_Cal	S_Cal	M_Ex	In_Mdw	Old_So	M_Atl	N_Eng
N_Cal	1						
S_Cal	0.4118	1					
M_Ex	0.2896	0.3828	1				
In_Mdw	0.3045	0.4234	0.3532	1			
Old_So	0.0331	-0.4856	-0.5999	0.1060	1		
M_Atl	0.1987	0.3736	0.6123	0.7583	-0.1787	1	
N_Eng	0.3396	0.5024	0.2210	0.7910	0.2483	0.5614	1

New England and low correlations with the other regions except the Old South. The Mineral Extraction region also exhibited low positive correlations with most regions except New England (semi-strong positive correlation) and Old South (negatively correlated).

Table 3.5
***NOI* Correlations by Subsidy Level**

Subsidy	< 20%	20% - 30%	> 30%
< 20%	1		
20% - 30%	0.4202	1	
> 30%	0.8249	0.6342	1

No diversification benefits from investing in developments that were heavily subsidized versus those less heavily subsidized were apparent. The correlations between the various subsidy levels were all positive and semi-strong to strong (Table 3.5).

The results were very similar for the average bedroom size (Table 3.6). No diversification benefits from having properties that were skewed towards larger versus smaller unit sizes were apparent.

Table 3.6
***NOI* Correlations by Bedrooms†**

Bedroom	< 1.5	1.5 - 2.0	> 2.0
< 1.5	1		
1.5 - 2.0	0.8123	1	
> 2.0	0.8288	0.4244	1

†Breakdown of properties by average bedrooms per unit.

3.4 Summary

The net operating income of HUD subsidized multi-family properties has performed as well as current yields on stocks and bonds and with less volatility from 1977 to 1991. The *NOI* was largely hedged against inflation although not perfectly. It did not outperform inflation over the fifteen years.

The *NOI* stream was negatively correlated to *Treasury Bill* yields and positively correlated to the *Dow Jones Earnings per Share Index* and the *Consumer Price Index.* The movements in *NOI* was negatively correlated to the movements in the *Dow Jones Earnings per Share Index*, and barely correlated to the movements in the *Treasury Bill* rate and the *Consumer Price Index.* Assuming the initial *NOI*s on these projects were large enough to produce competitive returns, the investments performed as well as stocks and bonds and with less risk. As well, the earnings streams from these investments appear to provide diversification benefits to a portfolio of mixed assets.

Within the sample itself, diversification by economic regions was an important consideration for risk management. There were benefits to the sample from holding investments across various regions. However, diversification by the level of HUD subsidy and by the unit size did not produce any noticeable benefits to the sample.

4/CONTRIBUTIONS TO NOI

The previous chapter discussed the performance of the net operating income stream and gross potential income stream of the sample group over a fifteen year period. This chapter presents a time-series analysis of the relationship between the net operating income and the independent variables of gross potential income, vacancy and operating expenses.

The *NOI* is, by definition, determined by *GPI, VAC,* and *OP_EXP.* It is the effect of each variable on *NOI* and to what degree *NOI* is independently determined by each variable that is of interest. Insights may be gained into what areas upon which asset managers should concentrate to maximize the income stream.

4.1 Methodology

To determine the relationship between *NOI* and each independent variable *GPI, VAC,* and *OP_EXP*, a separate linear equation was estimated for *NOI* and each variable. Because of the identity between *NOI*, *GPI*, *VAC* and *OP_EXP*, an equation incorporating the three independent variables would produce perfect correlations and meaningless results.

In the HUD programs in which these properties participate, the rents are determined by operating costs. The ability to pass those costs through to the tenants determines, to a large extent, the ability of the *NOI* to remain stable in real terms and not erode over time. In order to measure this stability, a regression equation was set up between *GPI* and *OP_EXP*.

The equations set up were:

$$\Delta NOI = \alpha + \beta \Delta GPI$$

$$\Delta NOI = \alpha + \beta \Delta VAC$$

$$\Delta NOI = \alpha + \beta \Delta OP\_EXP$$

$$\Delta GPI = \alpha + \beta \Delta OP\_EXP$$

To remove long term trend effects from inflation, first differences were used for the regressions.[1] Intuitively, it would be expected that the β-parameter, for both ΔVAC and ΔOP_EXP would be negative since an increase in these variables decreases *NOI*. In contrast, the coefficient for ΔGPI should be positive.

These equations were estimated for the sample to determine the contributors to *NOI*. It was also estimated for sub-samples, grouped by region and subsidy level, to determine the extent to which, if at all, different trends existed within the groups. Understanding these differences is a valuable asset management tool. For example, one region may be more influenced by operating expenses and another region may be more influenced by gross

[1]It is the movements in *NOI* and the causes of the movements that is being studied. A problem arises when both *NOI* and *GPI*, for instance, rise over time even though their movements may be negatively correlated. In a regression equation, they may show up as being positively correlated because the long term trends may dominate any short term adjustments. One way to remove this effect is to analyse first differences.

potential income. Therefore, management strategies for those respective regions should concentrate on the variable with the most impact on *NOI*.

4.2 Empirical Results

For the sample, ΔGPI and ΔOP_EXP were both significant (Table 4.1) with an average coefficient of determination (R^2) of 22%. The β-parameter for ΔGPI was positive, as expected. Similarly, the β-parameter for ΔOP_EXP was negative and smaller than the β-parameter for ΔGPI, as expected. The impact of movements in *GPI*, therefore, is greater than movements in ΔOP_EXP in absolute terms.

Table 4.1
Determinants of *NOI* in Total Sample

Regression Equation	R square (n = 14)	α (t-stat)	β (t-stat)
$\Delta NOI = \alpha + \beta \Delta GPI$	0.229	-0.070	1.878
		(-1.108)	(1.887)*
$\Delta NOI = \alpha + \beta \Delta VAC$	0.151	0.051	-0.138
		(2.472)*	(-1.462)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.215	0.121	-1.112
		(2.575)*	(-1.812)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.272	0.038	0.308
		(3.460)*	(2.116)*

* Significant at the 10% level.

The results indicate that *GPI* and *OP_EXP* both had a significant effect on *NOI* but the low coefficient of determinations does not make a strong argument for the conclusion. This is also true of the relationship between *GPI* and *OP_EXP*. It would be expected that if rents and expenses had a strong relationship, then income would not be affected much because they offset; thus, the coefficients of determinations for those equations would tend to be weak. In

contrast, if the relationship between rents and expenses is weak (suggesting that they are independent of each other) then the effects of each on income should register as being strong. This was not strongly supported by the data.

In the regional sub-samples, ΔOP_EXP was significant in all regions except the Mineral Extraction region (Table 4.2). The average coefficient of determination for the operating expense regression equations was 50% and all the β-parameters were negative and greater than one. Northern California had the largest β-parameter followed by the Industrial Midwest and New England, indicating that operating expenses had the greatest impact on net operating incomes in those regions. Southern California had the lowest β-parameter.

Two regions had a significant ΔGPI effect; Northern California and the Industrial Midwest. The β-parameter for both regions was positive, as expected, and the average coefficient of determination was 60%. Again, Northern California had the largest β-parameter followed by the Industrial Midwest. Considering that Northern California was affected the most by both income and expenses, it may be an indicator that this region had the most volatile income stream.

Only in the Old South region was ΔVAC significant, indicating that vacancies were not a significant factor in contributing to the net operating income in most areas. One may conclude that occupancy was consistent in these regions.

In two regions, Southern California and Mineral Extraction, There was found to be a significant relationship between rents and expenses. In the Mineral Extraction region, both rents and expenses did not have a significant effect on income, which is consistent with the earlier argument that rents and expenses would offset each other and not register as affecting income.

Table 4.2
Determinants of *NOI*: By Region

Regression Equation	R square (n = 14)	α (t-stat)	β (t-stat)
Northern California			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.458	-0.276	6.924
		(-1.916)*	(3.184)*
$\Delta NOI = \alpha + \beta \Delta VAC$	0.024	0.109	-0.081
		(0.886)	(-0.540)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.594	0.338	-3.519
		(3.517)*	(-4.192)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.027	0.058	0.073
		(4.000)*	(-0.577)
Southern California			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.059	-0.022	1.097
		(-0.226)	(0.871)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.001	0.052	-0.012
		(0.947)	(-0.111)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.314	0.157	-1.333
		(2.531)*	(-2.342)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.286	0.042	0.283
		(2.992)*	(2.195)*
Mineral Extraction			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.100	-0.037	1.737
		(-0.318)	(1.156)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.013	0.081	-0.032
		(0.973)	(-0.397)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.199	0.158	-1.470
		(1.830)*	(-1.726)
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.360	0.038	0.361
		(2.723)*	(2.598)*
Industrial Midwest			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.750	-0.161	3.453
		(-4.114)*	(5.998)*
$\Delta NOI = \alpha + \beta \Delta VAC$	0.179	0.021	0.186
		(0.570)	(1.615)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.463	0.229	-2.788
		(3.675)*	(-3.218)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.088	0.080	-0.304
		(3.929)*	(-1.073)

Table 4.2 (Cont'd)

Regression Equation	R square (n = 14)	α (t-stat)	β (t-stat)
Old South			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.157	-0.132	2.442
		(-1.414)	(1.492)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.363	0.043	-0.224
		(1.297)	(-2.618)*
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.579	0.120	-1.548
		(3.170)*	(-4.058)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.054	0.047	0.077
		(5.160)*	(0.831)
Mid-Atlantic Corridor			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.104	-0.047	2.163
		(-0.388)	(1.182)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.175	0.072	-0.193
		(1.539)	(-1.600)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.425	0.207	-1.705
		(3.672)*	(-2.979)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.106	0.051	0.127
		(4.904)*	(1.195)
New England			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.158	-0.079	2.488
		(-0.766)	(1.500)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.004	0.065	0.019
		(1.719)	(0.224)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.644	0.224	-2.468
		(5.537)*	(-4.655)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.012	0.055	0.054
		(5.141)*	(0.380)

*Significant at the 10% level.

Southern California had a somewhat weak coefficient of determination for the rent-expense regression, although significant, and therefore the results were not as conclusive. As expected, rents were not a significant contributor to income; however, expenses were a significant contributor to income, a result which was

not expected. This result may be due to rents and expenses not having a very strong relationship and therefore, expenses were a significant contributor.

The other regions did not have a significant relationship between rents and expenses and, as expected, in those regions expenses or rents or a combination of both affected income. In the regions where rents and expenses were significant, Northern California and Industrial Midwest, the data indicates that expenses were passed through to the tenants in the form of higher rents. In the regions where only expenses were significant, Old South, Mid-Atlantic Corridor and New England, it was more difficult to get rent increases and the rental stream stayed relatively flat.

The results for the sub-samples, ordered by subsidy levels, were similar, and more conclusive (Table 4.4). In all three sub-samples ΔOP_EXP was significant with an average coefficient of determination of 52%. The β-parameter was negative in all cases, as expected. The sub-sample with subsidies greater than 30% had *NOI* the most strongly affected by *OP_EXP* followed by the sub-sample with subsidies between 20% and 30%. It is interesting to note that the last sub-sample (subsidies less than twenty percent) had a β-parameter that was less than one, indicating that operating expenses in this sub-sample were relatively small. In comparison, the sub-sample with subsidies greater than 30% had a β-parameter almost three times as large. This indicates that in heavily subsidized properties expenses were the key factor to movements in income and to a more significant degree than in less heavily subsidized properties. The result is consistent, given that highly subsidized properties have thinner income margins because rents are lower due to the subsidies.

The only sub-sample where ΔVAC was significant was in the subsidy level between 20% and 30%. The β-parameter was negative and less than one,

as expected. As in the other cases, vacancies were relatively minor, indicating a consistent occupancy rate.

Table 4.4
Determinants of *NOI*: By Subsidy Level

Regression Equation	R square (n = 14)	α (t-stat)	β (t-stat)
Subsidy level < 20%			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.012	-0.002	0.344
		(-0.032)	(0.378)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.110	0.027	-0.090
		(1.210)	(-1.219)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.454	0.064	-0.771
		(2.902)*	(-3.156)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.329	0.033	0.207
		(4.300)*	(2.428)*
Subsidy level = 20%-30%			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.026	0.002	0.704
		(0.030)	(0.564)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.002	0.043	0.011
		(1.667)	(0.150)
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.482	0.151	-1.565
		(4.101)*	(-3.342)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.312	0.040	0.287
		(4.086)*	(2.331)*
Subsidy level > 30%			
$\Delta NOI = \alpha + \beta \Delta GPI$	0.005	0.037	0.967
		(0.155)	(0.251)
$\Delta NOI = \alpha + \beta \Delta VAC$	0.230	0.099	-0.331
		(1.675)	(-1.893)*
$\Delta NOI = \alpha + \beta \Delta OP\_EXP$	0.613	0.280	-2.894
		(4.695)*	(-4.364)*
$\Delta GPI = \alpha + \beta \Delta OP\_EXP$	0.212	0.051	0.127
		(8.071)*	(1.797)*

*Significant at the 10% level.

In conclusion, operating expenses were the most significant contributor to movements in net operating income, which is where asset managers should be focusing their efforts to control income.

5/PERFORMANCE INDICATORS

This chapter is an examination of the relationship between *NOI* and property specific characteristics to determine which of the characteristics influenced the growth and variance,[1] in *NOI*. A cross-section analysis is employed. As an investment, it is high growth, implying high current yield, and low variance, implying low risk, in *NOI* that is desirable. This chapter attempts to define what characteristics determine whether a project will be successful on those terms.

External economic data such as gross domestic products, demographic and employment trends was not part of this analysis. It is not because they do not exhibit any relationships to the performance of *NOI*, on the contrary, they influence the performance of these properties greatly, but because they are considerations for market research and this study is examining only the influence of property specific characteristics.

[1]Variance is used as a proxy for risk. Therfore low variance implies low risk, and vice-versa

5.1 Methodology

In order to develop insights into the growth in *NOI*, a cross-section analysis of the growth in *GPI* and *OP_EXP* was examined. Because of the underlying identity between *NOI, GPI* and *OP_EXP*, more can be learned by analysing each individual component of *NOI*. For example, if the number of units increases both the operating expense growth and the gross potential income growth, they would negate each other and not register as affecting net operating income. If each component is analysed separately, then the impact of the number of units on each becomes evident and the underlying reasons why *NOI* is not affected becomes clear.

Chapter 4 showed that vacancy was not a significant contributor to movements in net operating income. Therefore, it was not part of the analysis in this chapter because the results would not be of consequence.

The following regression equations, employed across all properties, were used to determine which characteristics influenced the growth in gross potential income and operating expenses:

$$GPI\_Growth = \alpha + ß_1 UNITS + ß_2 BDRM + ß_3 SUBSIDY + ß_4 GPI/Unit + ß_5 OP\_EXP/Unit + ß_6 D_1 + ß_7 D_2 + ß_8 D_3 + ß_9 D_4 + ß_{10} D_5 + ß_{11} D_6$$

and

$$OP\_EXP\_Growth = \alpha + ß_1 UNITS + ß_2 BDRM + ß_3 SUBSIDY + ß_4 GPI/Unit + ß_5 OP\_EXP/Unit + ß_6 D_1 + ß_7 D_2 + ß_8 D_3 + ß_9 D_4 + ß_{10} D_5 + ß_{11} D_6$$

where

GPI_Growth = growth in gross potential income[2]

[2]Growth was measured as the percentage increase of the last year versus the first year. Since it was real growth that was of interest, nominal dollars were converted to constant 1977 dollars.

OP_EXP_Growth = growth in operating expenses[2]
UNITS = number of units in property
BDRM = average number of bedrooms per unit in property
SUBSIDY = annual HUD subsidy as percentage of first year *GPI*
GPI/Unit = gross potential income per unit in first year
OP_EXP/Unit = operating expenses per unit in first year
D_1 = 0-1 dummy variable for Northern California
D_2 = 0-1 dummy variable for Southern California
D_3 = 0-1 dummy variable for Mineral Extraction
D_4 = 0-1 dummy variable for Industrial Midwest
D_5 = 0-1 dummy variable for Old South
D_6 = 0-1 dummy variable for Mid-Atlantic Corridor

UNITS and *BDRM* were added to the regression to determine if the physical characteristics of the property had any influences on growth. The regional dummy variables were added to capture any regional effects[3] and *SUBSIDY* was added to capture any effects due to the relative levels of HUD subsidies. The *GPI/Unit* variable was added to determine if the positioning of the property in the market, in terms of rents, had any impact on growth and the *OP_EXP/Unit* was added to determine if higher maintenance properties behaved differently.

Similar regression equations were used to estimate the relationships between the same independant variables and the standard deviations of the annual percentage change in *GPI* and *OP_EXP*.[4] This measure of variance was used to estimate the volatility, hence risk, of the *NOI* stream. Therefore, the following regression equations were used to estimate the relationships:

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[3]New England is the reference location.
[4]Nominal values were converted to constant 1977 dollars to determine the volatility in real growth. As well, the movements about the trend line represent the real risk and therefore long term trends should be removed before calculating the standard deviation. If it isn't, the calculated values would erroneously include the effects of the trend. One way to avoid this problem is to analyse first differences.

$$GPI\_Var = \alpha + ß_1 UNITS + ß_2 BDRM + ß_3 SUBSIDY + ß_4 GPI/Unit + ß_5 OP\_EXP/Unit + ß_6 D_1 + ß_7 D_2 + ß_8 D_3 + ß_9 D_4 + ß_{10} D_5 + ß_{11} D_6$$

and

$$OP\_EXP\_Var = \alpha + ß_1 UNITS + ß_2 BDRM + ß_3 SUBSIDY + ß_4 GPI/Unit + ß_5 OP\_EXP/Unit + ß_6 D_1 + ß_7 D_2 + ß_8 D_3 + ß_9 D_4 + ß_{10} D_5 + ß_{11} D_6$$

The independant variables in these regression equations were the same ones used for the growth equations.

5.2 Empirical Results

For growth in *GPI*, the initial *GPI/Unit*, *UNITS*, and all regions except Southern California and the Mid-Atlantic Corridor were significant (Table 5.1).

The ß-parameter for *UNITS* was positive and too small to be of consequence. For example, a property with 100 more units had a growth in rents, over the fifteen year period, increase by only 0.1%.

The ß-parameter for the initial *GPI/Unit* or rent per unit was negative. This indicates that units positioned higher in the market, initially, experienced a lower growth in rents than units positioned lower in the market.[5]

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[5]Implicit in the regression equation for *GPI* growth are two factors: a growth effect for that specific property in a particular region and a growth effect of a particular region relative to other regions. The equation

$$GPI\_Growth = ... + ß[GPI/Unit] + ... + \gamma D$$

can be broken into

$$GPI\_Growth = ... + ß[GPI/Unit]_P + ß[GPI/Unit]_R + ... + \gamma D$$

where the subscript P is for the property growth effect and R is for the regional growth effect and *D* is the regional dummy variable. What actually occurs in the regression is that all the regional

Table 5.1
Determinants of Growth in *GPI* and *OP_EXP*

Variable	Coefficient	t-statistic
	Growth in *GPI*	
$R^2 = 0.373$		
n = 61		
Intercept	2.159	5.035*
UNITS	1.06E-05	5.035*
BDRM	-0.016	-0.197
SUBSIDY	-0.049	-0.177
GPI/Unit	-3.81E-04	-2.300*
OP_EXP/Unit	1.84E-04	1.071
D_1 *(Northern California)*	-0.544	-2.756*
D_2 *(Southern California)*	-0.329	-1.413
D_3 *(Mineral Extraction)*	-0.431	-1.692*
D_4 *(Industrial Midwest)*	-0.386	-2.414*
D_5 *(Old South)*	-0.409	2.037*
D_6 *(Mid-Atlantic Corridor)*	-0.114	-0.746
	Growth in *OP_EXP*	
$R^2 = 0.438$		
n = 61		
Intercept	2.645	4.025*
UNITS	9.82E-04	1.368
BDRM	0.118	0.944
SUBSIDY	0.483	1.136
GPI/Unit	2.89E-04	1.487
OP_EXP/Unit	-0.001	-4.924*
D_1 *(Northern California)*	-0.737	-2.436*
D_2 *(Southern California)*	-0.697	-1.953*
D_3 *(Mineral Extraction)*	-0.926	-2.371*
D_4 *(Industrial Midwest)*	-0.543	-2.215*
D_5 *(Old South)*	-0.384	-1.248
D_6 *(Mid-Atlantic Corridor)*	-0.272	-1.158

*Significant at the 10% level.

Of the regions that were significant, New England had the highest rental growth. The other regions all had ß-parameters that were negative indicating

effects are represented in the dummy variable and only the property growth effect is in the ß-parameter. Therefore, a negative sign on the ß-parameter implies that when the initial rents in the property is high, relative to the region, the growth in rents is lower.

lower growth relative to New England. Northern California had the lowest relative growth, at 54% lower than New England.

The results for operating expense growth indicate that the only property characteristic that is significant is *OP_EXP/Unit* (Table 5.1). The ß-parameter was negative indicating that units with higher initial operating expenses experienced less growth in operating expenses implying that these units had stabilized operating expenses whereas units with lower initial operating expenses did not.

Of the regional variables, all were significant except the Old South and the Mid-Atlantic Corridor. New England had the highest growth in operating expenses followed by the Industrial Midwest (54% lower), Southern California (70% lower), Northern California (73% lower) and Mineral Extraction (93% lower).

For variance in *GPI* growth, *GPI/Unit*, *OP_EXP/Unit,* Northern California, Southern California and New England were significant (Table 5.2).

The ß-parameter for *GPI/Unit* was negative indicating that units positioned higher in the market experienced lower variance in rents. Conversely, the ß-parameter for *OP_EXP/Unit* was positive indicating that units with higher initial operating expenses experienced higher variance in rents.

The three regions that were significant had similar ß-parameters. New England had the lowest, followed by Northern California then Southern California. The ß-parameters were positive in both cases with Southern California being only 2.8% higher than New England. This indicates that the two western regions both had higher variances in their gross rents.

The results for variance in operating expense growth were not as conclusive. The only significant variable was *UNITS* with a positive ß-parameter. This implies that the larger properties had higher variances in their

operating expense than the smaller properties. The other variables were all insignificant thus it was inconclusive which factors contributed to the volatility of movements in *OP_EXP*.

Table 5.2
Determinants of Variance† in *GPI* and *OP_EXP*

Variable	Coefficient	t-statistic
	Variance in *GPI*	
$R^2 = 0.585$		
n = 61		
Intercept	0.072	3.834*
UNITS	-7.05E-06	-0.346
BDRM	-0.002	-0.597
SUBSIDY	-0.013	-1.081
GPI/Unit	-1.48E-05	-2.676*
OP_EXP/Unit	1.35E-05	1.805*
D_1 *(Northern California)*	0.020	2.304*
D_2 *(Southern California)*	0.028	2.727*
D_3 *(Mineral Extraction)*	0.016	1.461
D_4 *(Industrial Midwest)*	-0.008	-1.118
D_5 *(Old South)*	-0.006	-0.736
D_6 *(Mid-Atlantic Corridor)*	0.002	0.265
	Variance in *OP_EXP*	
$R^2 = 0.195$		
n = 61		
Intercept	0.569	1.321
UNITS	0.001	2.423*
BDRM	-0.036	-0.439
SUBSIDY	-0.136	-0.489
GPI/Unit	-6.07E-05	-0.476
OP_EXP/Unit	-1.69E-04	-0.981
D_1 *(Northern California)*	-0.162	-0.816
D_2 *(Southern California)*	-0.296	-1.263
D_3 *(Mineral Extraction)*	-0.198	-0.774
D_4 *(Industrial Midwest)*	-0.249	-1.552
D_5 *(Old South)*	-0.282	-1.397
D_6 *(Mid-Atlantic Corridor)*	0.054	0.351

†Standard deviation of annual change in constant 1977 dollars.
*Significant at the 10% level.

Summarizing the results of the four regression equations, it appears that the properties with high initial *NOI*'s, implying high initial rents and low initial operating expenses, had their *NOI*'s grow less over time than properties with low initial *NOI*'s. This is contrary to what investors believe would happen. Going into an investment, it is the high inital *NOI*'s that is attractive. From this research, it is apparent that a more detailed analysis of the operating expenses and the relative positioning of the rents in the marketplace is warranted because the low *NOI* projects performed better over time than the high *NOI* projects. That is, the proformas should be scrutinized to ensure that the rents are not high compared to the market, and that the operating expenses are reflective of stabilized operations.

The regions also exhibited differences with New England having the highest rental growth as well as the highest operating expense growth. Therefore, it had a relatively flat *NOI* growth. By contrast, the Mineral Extraction region had a 43% lower growth in *GPI* but its *OP_EXP* had a 93% lower growth. Therefore its *NOI* had a higher growth than New England's. The Industrial Midwest and Northern California were in between these two regions.

6/CONCLUSIONS

This research analysed the investment performance of HUD subsidized, multi-family properties to determine some characteristics of this type of property as an investment product.

It was determined that the net operating income stream performed as well as other capital market investments such as stocks and bonds and with more predictability and stability. The income stream was largely hedged against inflation and the rental growth actually outperformed the *CPI-UX Rent Index* over the fifteen year period.

This investment was a good diversifier to a portfolio of mixed assets because it exhibited negative correlations of movements in current yields to the stock market, and very low correlations to Treasury Bills, and the *CPI*. There was also diversification benefits to the sample by economic regions. There were no benefits to the sample by subsidy level or unit size.

It was discovered that the greatest influence to the movements in *NOI* was operating expenses. Few regions had a significant *GPI* effect and only one had a significant *VAC* effect. Therefore, controlling operating expenses is the most critical factor in controlling income. This indicates that rents are inelastic upwards and operating expenses cannot be passed through quickly to the tenants.

It appears that the properties that had the largest growth in *NOI* over the study period were the ones with the highest initial operating expenses and lowest initial rents. This implies that the positioning of the units in the marketplace is important and that initial proformas should reflect higher operating expenses. One reason may be that HUD, in approving rent increases generally allowed increases if there were regional effects (such as increased utility costs in New England) but were reluctant to allow increases if a specific property had extraordinary increases in operating expenses. Perhaps, they viewed that as bad management and were not willing to reward it.

Finally, this study was limited in its scope and reach and attempted to shed some light on a area of real estate investment about which very little was known. What was started here can easily be built upon by bringing in other macroeconomic factors and demographic data. Another area of research to consider is the development of a return series for these investments and compare it to other real estate products.

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